






# Chapter 9

## Braking system

### Contents

|   |                     |  |               |
|---|---------------------|--|---------------|
| Brake disc - inspection, removal and refitting . . . . .              | 9                   | Hydraulic system - bleeding . . . . .  | 2             |
| Brake drum - removal, inspection and refitting . . . . .              | 4                   | Master cylinder (single circuit system) - removal, overhaul and refitting . . . . .                      | 12            |
| Brake fluid level check . . . . .                                     | See "Weekly checks" | Pressure differential warning actuator (dual circuit system) - removal, overhaul and refitting . . . . . | 20            |
| Brake fluid renewal . . . . .   | See Chapter 1       | Pressure reducing valve (dual circuit system) - removal and refitting . . . . .                          | 19            |
| Brake pad wear check . . . . .  | See Chapter 1       | Pressure regulating valve (single circuit system) - removal, overhaul and refitting . . . . .            | 18            |
| Brake pedal - removal and refitting . . . . .                         | 23                  | Tandem master cylinder (dual circuit system) - Identification and modifications . . . . .                | 13            |
| Brake shoe wear check . . . . .                                       | See Chapter 1       | Tandem master cylinder (type 1) - removal, overhaul and refitting . . . . .                              | 14            |
| Disc brake caliper - removal, overhaul and refitting . . . . .        | 8                   | Tandem master cylinder (type 2) - removal, overhaul and refitting . . . . .                              | 15            |
| Disc brake pads - renewal . . . . .                                   | 7                   | Tandem master cylinder (type 3) - removal, overhaul and refitting . . . . .                              | 16            |
| Drum brake adjustment . . . . .                                       | See Chapter 1       | Tandem master cylinder (type 4) - removal, overhaul and refitting . . . . .                              | 17            |
| Drum brake shoes - renewal . . . . .                                  | 5                   | Underbody and fuel/brake line check . . . . .  | See Chapter 1 |
| Drum brake wheel cylinder - removal, overhaul and refitting . . . . . | 6                   | Vacuum servo unit - removal and refitting . . . . .  | 21            |
| General information . . . . .   | 1                   | Vacuum servo unit air filter (1989 models onward) - renewal . . . . .                                    | 22            |
| Handbrake adjustment . . . . .  | See Chapter 1       |  |               |
| Handbrake cable - removal and refitting . . . . .                     | 10                  |  |               |
| Handbrake lever - removal and refitting . . . . .                     | 11                  |  |               |
| Hydraulic pipes and hoses - renewal . . . . .                         | 3                   |  |               |

### Degrees of difficulty

|   |  |  |   |  |
|---|--|--|---|--|
| <b>Easy</b> , suitable for novice with little experience<br> | <b>Fairly easy</b> , suitable for beginner with some experience<br> | <b>Fairly difficult</b> , suitable for competent DIY mechanic<br> | <b>Difficult</b> , suitable for experienced DIY mechanic<br> | <b>Very difficult</b> , suitable for expert DIY or professional<br> |
|---|--|--|---|--|

### Specifications

#### System type

|                     |   |
|---------------------|---|
| Footbrake . . . . . | Lockheed single or dual circuit hydraulic, servo assisted on certain models |
| Handbrake . . . . . | Mechanical by cables to rear brakes   |

#### Front drum brakes

|   |                   |
|---|-------------------|
| Type . . . . .                                | Twin leading shoe |
| Drum diameter . . . . .                       | 178.0 mm          |
| Minimum brake shoe lining thickness . . . . . | 3.0 mm            |

#### Front disc brakes

|                                       |                               |
|---------------------------------------|-------------------------------|
| Type . . . . .                        | Disc with twin piston caliper |
| Disc diameter:                        |                               |
| Cooper S models . . . . .             | 190.5 mm                      |
| All other models . . . . .            | 213.4 mm                      |
| Maximum disc run-out . . . . .        | 0.15 mm                       |
| Minimum brake pad thickness . . . . . | 3.0 mm                        |

#### Rear brakes

|   |                          |
|---|--------------------------|
| Type . . . . .                                | Single leading shoe drum |
| Drum diameter . . . . .                       | 178.0 mm                 |
| Minimum brake shoe lining thickness . . . . . | 3.0 mm                   |

#### Torque wrench settings

|   | Nm         | lbf ft     |
|---|------------|------------|
| Driveshaft retaining nut (disc brake models):                   |            |            |
| With multiple split pin holes in driveshaft . . . . .           | 207        | 150        |
| With single split pin hole in driveshaft . . . . .              | 255 to 270 | 188 to 200 |
| Brake caliper retaining bolts . . . . .                         | 52         | 38         |
| Disc to hub flange . . . . .                                    | 57         | 42         |
| Master cylinder body outlet plugs . . . . .                     | 39         | 28         |
| Master cylinder pressure differential piston end plug . . . . . | 45         | 33         |
| Pressure differential warning actuator end plug . . . . .       | 35         | 26         |
| Pressure differential warning actuator failure switch . . . . . | 19         | 14         |

### 1 General information

Drum brakes are fitted to the front and rear wheels on all early models except Cooper S and 1275 GT versions. These, and all later models have disc brakes at the front. The braking system is operated hydraulically by a master cylinder, which is actuated by the brake pedal. Disc brake models may also be servo assisted by a vacuum servo unit mounted in the engine compartment.

The hydraulic system on early models is of the single circuit type, whereby both the front and rear brakes are operated by the same hydraulic system from the master cylinder. On later models a dual circuit system is used, whereby the brakes at each pair of wheels are operated by a separate hydraulic system from a tandem master cylinder. In the event of hydraulic failure in one circuit, full braking force will still be available at two wheels. On early dual circuit systems a diagonal split is used, each circuit supplying one front and one diagonally opposite rear brake. Later versions employ a front-to-rear split whereby both front and both rear brakes are operated by a separate hydraulic circuit. A pressure differential warning actuator is fitted to certain models to inform the driver of a hydraulic circuit failure via an illuminated warning light, and also to restrict the flow of hydraulic fluid into the failed circuit. This unit is either mounted separately on the engine compartment bulkhead, or incorporated in the master cylinder. On single circuit and certain dual circuit systems, a pressure reducing valve is incorporated in the rear brake circuit. This valve reduces hydraulic fluid pressure to the rear brakes and prevents rear wheel lock-up due to forward weight transfer under heavy braking. On models not equipped with a pressure reducing valve, the same effect is achieved by reducing the rear wheel cylinder piston diameters. A low brake fluid warning light is also fitted to later models operated by a float-type switch in the master cylinder reservoir filler cap.

On models fitted with front drum brakes, the brake shoes are operated by two single piston wheel cylinders at each front wheel. Models with front disc brakes utilise a twin piston fixed type caliper at each front wheel. At the rear on all models, one twin piston wheel cylinder operates each wheel's leading and trailing brake shoes.

The handbrake provides an independent mechanical means of rear brake shoe application.

Adjustment of the drum brakes is provided by two adjusters on each front brake and a single adjuster on each rear brake. Periodic adjustment is necessary to compensate for wear on the brake shoe friction linings. The front disc brakes do not require adjustment, as the pistons in the caliper automatically compensate for brake pad wear.

**Note:** When servicing any part of the system, work carefully and methodically; also observe scrupulous cleanliness when overhauling any part of the hydraulic system. Always renew components (in axle sets, where applicable) if in doubt about their condition, and use only genuine Rover replacement parts, or at least those of known good quality. Note the warnings given in "Safety first" and at relevant points in this Chapter concerning the dangers of asbestos dust and hydraulic fluid.

### 2 Hydraulic system - bleeding



**Warning:** Hydraulic fluid is poisonous; wash off immediately and thoroughly in the case of skin contact, and seek immediate medical advice if any fluid is swallowed or gets into the eyes. Certain types of hydraulic fluid are inflammable, and may ignite when allowed into contact with hot components; when servicing any hydraulic system, it is safest to assume that the fluid IS inflammable, and to take precautions against the risk of fire as though it is petrol that is being handled. Hydraulic fluid is also an effective paint stripper, and will attack plastics; if any is spilt, it should be washed off immediately, using copious quantities of clean water. Finally, it is hygroscopic (it absorbs moisture from the air). The more moisture is absorbed by the fluid, the lower its boiling point becomes, leading to a dangerous loss of braking under hard use. Old fluid may be contaminated and unfit for further use. When topping-up or renewing the fluid, always use the recommended type, and ensure that it comes from a freshly-opened sealed container.

#### General

1 The correct functioning of the brake hydraulic system is only possible after removing all air from the components and circuit; this is achieved by bleeding the system.

2 During the bleeding procedure, add only clean, fresh hydraulic fluid of the specified type; never re-use fluid that has already been bled from the system. Ensure that sufficient fluid is available before starting work.

3 If there is any possibility of incorrect fluid being used in the system, the brake lines and components must be completely flushed with uncontaminated fluid and new seals fitted to the components.

4 If brake fluid has been lost from the master cylinder due to a leak in the system, ensure that the cause is traced and rectified before proceeding further.

5 Park the car on level ground, switch off the ignition and select first gear (manual transmission) or Park (automatic transmission) then chock the wheels and release the handbrake.

6 Check that all pipes and hoses are secure, unions tight, and bleed screws closed. Remove the dust caps and clean any dirt from around the bleed screws.

7 Unscrew the master cylinder reservoir cap, and top-up the reservoir. Refit the cap loosely, and remember to keep the reservoir topped up throughout the procedure, otherwise there is a risk of further air entering the system.

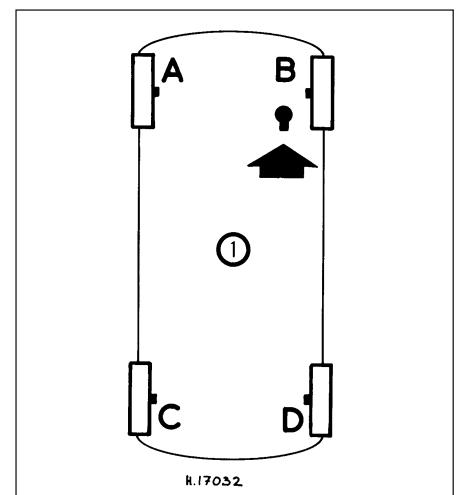
8 There are a number of one-man, do-it-yourself, brake bleeding kits currently available from motor accessory shops. It is recommended that one of these kits is used wherever possible, as they greatly simplify the bleeding operation, and also reduce the risk of expelled air and fluid being drawn back into the system. If such a kit is not available, collect a clean glass jar of reasonable size and a suitable length of plastic or rubber tubing, which is a tight fit over the bleed screw.

9 If a kit is to be used, prepare the car as described previously, and follow the kit manufacturer's instructions, as the procedure may vary slightly according to the type being used; generally, they are as outlined in the text below.

10 The procedure for bleeding varies according to whether the car is equipped with a single or dual circuit braking system, and also with dual circuit systems, the type of master cylinder that is fitted. Identify the type of system being worked on by referring to the illustrations, and to Section 13, then proceed according to type.

#### Single circuit system

11 To bleed the system, clean the area around the bleed screw of the wheel to be bled. If the hydraulic system has only been partially disconnected, and suitable precautions were taken to prevent further loss of fluid, it should only be necessary to bleed that part of the system. However, if the entire system is to be bled, proceed in the sequence ABCD for right-hand drive cars, and BADC for left-hand drive vehicles (see illustration).



2.11 Bleeding sequence for single circuit braking systems



**2.13 One-man brake bleeding kit connected to the front bleed screw**

12 Remove the master cylinder reservoir filler cap and top-up the reservoir. Periodically check the fluid level during the bleeding operation and top-up as necessary.

13 If a one-man brake bleeding kit is being used, connect the outlet tube to the bleed screw (see illustration) and then open the screw approximately one turn. Position the unit so that it can be viewed from the car then depress the brake pedal to the floor and rapidly release it. The one-way valve in the kit will prevent expelled air from returning to the system at the end of each stroke. Repeat this operation until clean hydraulic fluid, free from air bubbles, can be seen coming through the tube. Then tighten the bleed screw and remove the outlet tube.

14 If a one-man brake bleeding kit is not available, connect one end of the plastic tubing to the bleed screw and immerse the other end in the jar containing sufficient clean hydraulic fluid to keep the end of the tube submerged.

15 Open the bleed screw approximately one turn and have your assistant depress the brake pedal to the floor, and then rapidly release it. Tighten the bleed screw at the end of each downstroke to prevent expelled air from being drawn back into the system.

16 Repeat this operation until clean hydraulic fluid, free from air bubbles, can be seen coming through the tube. Then tighten the bleed screw on a downstroke and remove the plastic tube.

17 If the entire system is being bled the procedures described previously should now be repeated at each wheel in the correct sequence.

18 When completed, check the fluid level in the master cylinder, top-up if necessary, and refit the cap. Check the feel of the brake pedal, which should be firm and free from any sponginess; this would indicate air still present in the system.

19 Discard any used hydraulic fluid, as the minute air bubbles and contamination which will be present in the fluid make it unsuitable for further use in the hydraulic system.

### Dual circuit system (early type)

20 The following procedure is applicable to the type 1 tandem master cylinder (see Section 13) fitted to diagonally-split hydraulic systems.

21 To bleed the system, clean the area around the bleed screws of the wheels to be bled. If only half of the hydraulic system has been disconnected, it should only be necessary to bleed that half, provided no air has entered the other half. However, if the entire system is to be bled, proceed in the sequence ABCD for right-hand drive cars and BADC for left-hand drive vehicles (see illustration).

22 The procedure is now the same as described in paragraphs 12 to 19 for the single circuit system, except that the brake pedal should be depressed rapidly, held down for three seconds and then released slowly. A delay of fifteen seconds should then be allowed before repeating.

23 When bleeding is complete, check the operation of the pressure differential warning actuator as described in Section 20.

### Dual circuit system (later type)

24 The following procedure is applicable to the type 2, 3 and 4 tandem master cylinders (see Section 13) fitted to diagonally-split and front-to-rear split hydraulic systems.

25 Before commencing the bleeding operation, unscrew the brake failure warning switch (where fitted) from the side of the master cylinder body. (No fluid loss will occur unless there is internal pressure differential piston seal failure.)

**Note:** If the system is being bled following renewal of the master cylinder, check whether a plastic spacer is fitted between the pressure switch and master cylinder body. If a spacer is present, leave it in position during the bleeding operation and then discard it.

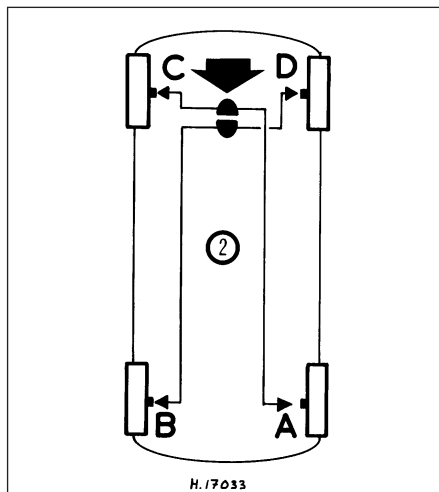
26 To bleed the system, clean the area around the bleed screws of the wheels to be bled. If only half of the hydraulic system has been disconnected, it should only be necessary to bleed that half, provided no air has entered the other half. However, if the entire system is to be bled, it must be done in the following sequence.

27 For diagonally split systems, proceed in the order ABCD for right-hand drive cars, and CDAB for left-hand drive vehicles (see illustration).

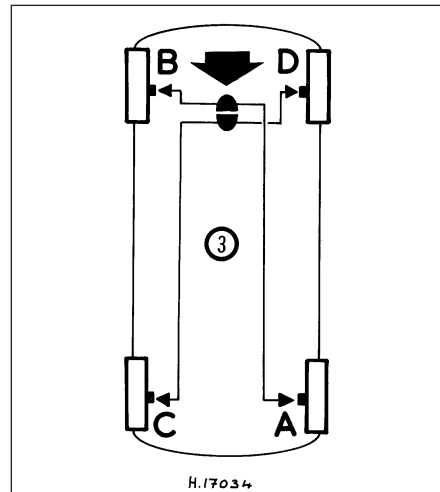
28 For front-to-rear split systems, proceed in the order ABCD, irrespective of driving position (see illustration).

29 The procedure is now the same as described in paragraphs 12 to 19 for the single circuit system, except that the brake pedal should be depressed rapidly, held down for three seconds, and then released slowly. A delay of fifteen seconds should then be allowed before repeating.

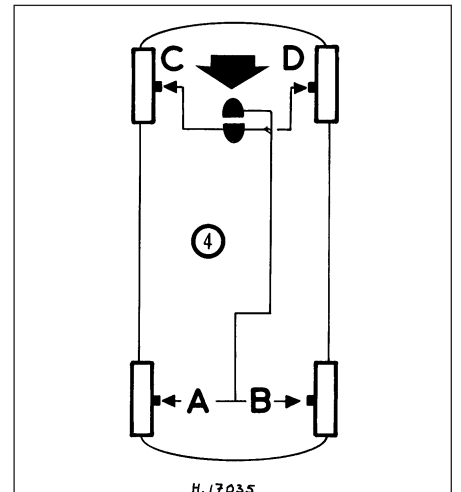
30 Where applicable, refit the brake failure warning switch and tighten it to the specified torque after completing the bleeding operation.



**2.21 Bleeding sequence for type 1 tandem master cylinder - see text**

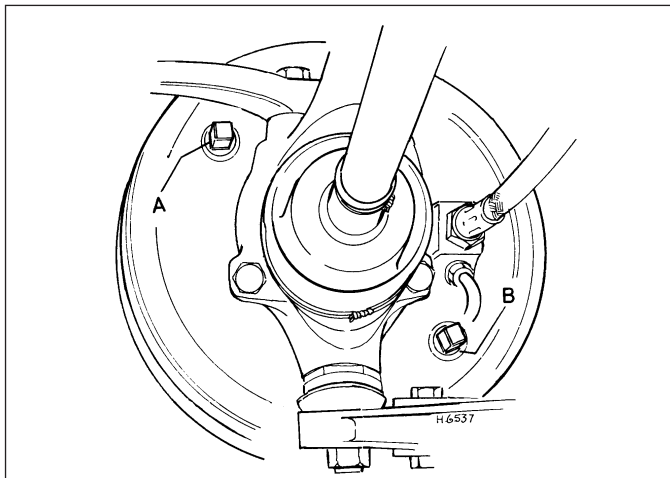


**2.27 Bleeding sequence for type 2, 3 and 4 tandem master cylinders with diagonal split dual circuit braking systems - see text**

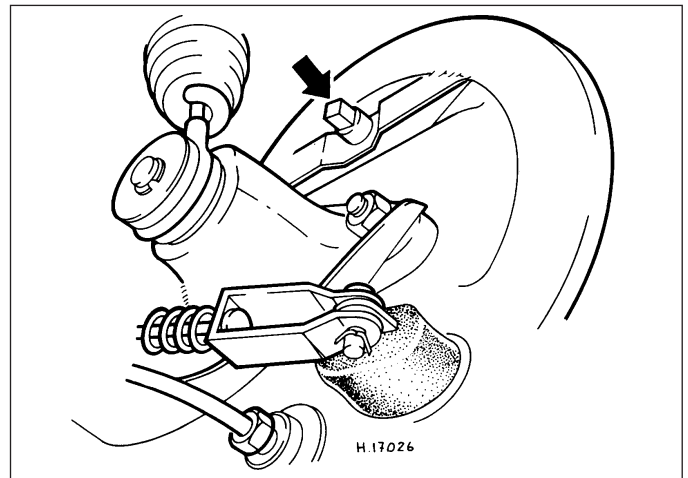


**2.28 Bleeding sequence for type 2, 3 and 4 tandem master cylinders with front-to-rear split dual circuit braking systems - see text**

## 9•4 Braking system



4.2a Location of the two front brake adjusters - A and B



4.2b Location of the rear brake adjuster - arrowed

### 3 Hydraulic pipes and hoses - renewal



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

1 If any pipe or hose is to be renewed, minimise hydraulic fluid loss by removing the master cylinder reservoir cap, placing a piece of plastic film over the reservoir and sealing it with an elastic band. Alternatively, flexible hoses can be sealed, if required, using a proprietary brake hose clamp; metal brake pipe unions can be plugged (if care is taken not to allow dirt into the system) or capped immediately they are disconnected. Place a wad of rag under any union that is to be disconnected, to catch any spilled fluid.

2 If a flexible hose is to be disconnected, unscrew the brake pipe union nut before undoing the nut which secures the hose to its mounting. At the front, the other end of the hose will be screwed into its tapped hole in the wheel cylinder or brake caliper.

3 To unscrew the union nuts, it is preferable to obtain a brake pipe spanner of the correct size; these are available from most large motor accessory shops. Failing this, a close-

fitting open-ended spanner will be required, though if the nuts are tight or corroded, their flats may be rounded-off if the spanner slips. In such a case, a self-locking wrench is often the only way to unscrew a stubborn union, but it follows that the pipe and the damaged nuts must be renewed on reassembly. Always clean a union and surrounding area before disconnecting it. If disconnecting a component with more than one union, make a careful note of the connections before disturbing any of them.

4 If a brake pipe is to be renewed, it can be obtained, cut to length and with the union nuts and end flares in place, from Rover dealers. All that is then necessary is to bend it to shape, following the line of the original, before fitting it to the car. Alternatively, most motor accessory shops can make up brake pipes from kits, but this requires very careful measurement of the original, to ensure that the replacement is of the correct length. The safest answer is usually to take the original to the shop as a pattern.

5 Before refitting, blow through the new pipe or hose with dry compressed air. Do not overtighten the union nuts. It is not necessary to exercise brute force to obtain a sound joint.

6 If flexible rubber hoses are renewed, ensure that the pipes and hoses are correctly routed,

with no kinks or twists, and that they are secured in the clips or brackets provided.

7 After fitting, bleed the hydraulic system as described in Section 2, wash off any spilled fluid, and check carefully for fluid leaks.

### 4 Brake drum - removal, inspection and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 5 concerning the dangers of asbestos dust.

#### Removal

1 Chock the wheels then jack up the front or rear of the car as applicable and support it on axle stands (see "Jacking and vehicle support"). Remove the relevant roadwheels.

2 Slacken off the brake shoe adjuster(s) from behind the backplate, then undo and remove the two brake drum retaining screws (see illustrations).

3 Remove the brake drum from the wheel hub (see illustration). If the drum is tight, gently tap its circumference with a soft-faced mallet.

#### Inspection

4 Brush the dust and dirt from the brake drum and carefully inspect the drum interior.

5 If the drum is grooved, owing to failure to renew worn brake shoes or after a very high mileage has been covered, then it may be possible to grind it, provided the grooving is not excessive.

6 Even if only one drum is in need of grinding both drums must be reground to the same size in order to maintain even braking characteristics.

7 Judder or a springy pedal felt when the brakes are applied can be caused by a distorted (out-of-round) drum. Here again it may be possible to grind the drums, otherwise a new drum will be required.

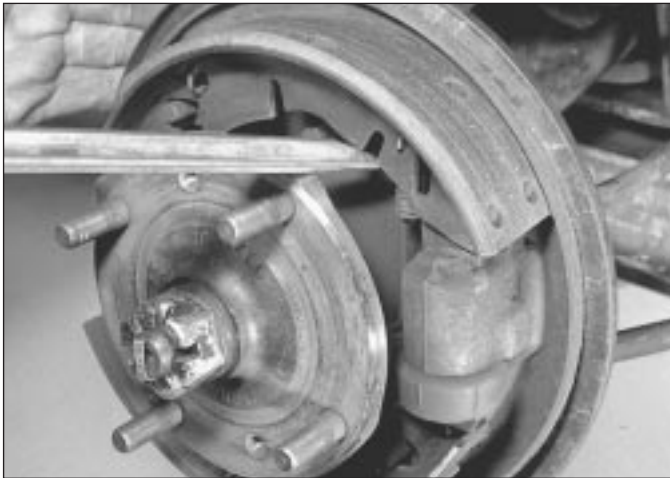


4.2c Remove the brake drum retaining screws . . .



4.3 . . . and withdraw the drum





5.4a Remove the front brake shoes from the wheel cylinder pivot end first . . .



5.4b . . . and then from the piston end

### Refitting

8 Refitting is the reverse sequence to removal. Adjust the brakes as described in Chapter 1 before lowering the car to the ground.

## 5 Drum brake shoes - renewal



**Warning:** Brake shoes must be renewed on both front or both rear wheels at the same time - never renew the shoes on only one wheel, as uneven braking may result. Also, the dust created by wear of the shoes may contain asbestos, which is a health hazard. Never blow it out with compressed air, and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. DO NOT use petrol or petroleum-based solvents to clean brake parts; use brake cleaner or methylated spirit only.

1 Remove the brake drum as described in Section 4.

2 Brush the dust and dirt from the shoes, backplate and drum.

3 Before removing the brake shoes, make a note of the positions of the shoes and the return springs and then remove the brake shoes as follows.

### Front brakes

4 First release the small hook springs (where fitted) securing the brake shoes to the wheel cylinder pistons. Now lift the end of each shoe off the pivot side of each wheel cylinder, and then the other end off the wheel cylinder pistons. Detach the return springs and withdraw the shoes (see illustrations).

5 If necessary, position a rubber band over the wheel cylinders to prevent the pistons coming out. Should there be evidence of brake fluid leakage from the wheel cylinder, renew it or overhaul it, as described in Section 6.

6 Refitting the front brake shoes is the reverse sequence to removal, bearing in mind the following points:

- Before refitting the shoes, smear a trace of high-melting-point brake grease to the pivot areas of the wheel cylinder, brake adjuster and backplate.
- Do not allow any grease or hydraulic fluid to come into contact with the brake shoe linings.

c) Ensure that the shoes are refitted correctly and the return springs are in their correct holes.

d) Repeat all the above operations on the opposite front brake.

e) With the brake shoes assembled and drums refitted, adjust the brakes as described in Chapter 1.

### Rear brakes

7 Lift the top of both shoes off the brake adjuster pivots and detach the top brake shoe return spring. Now lift the bottom of the front shoe off the wheel cylinder piston and disengage the handbrake operating lever (see illustrations). Repeat this for the rear shoe and lift away both shoes and lower return spring.

8 If necessary, position a rubber band over the wheel cylinders to prevent the pistons coming out. Should there be evidence of brake fluid leakage from the wheel cylinder, renew it or overhaul it, as described in Section 6.

9 Refitting the rear brake shoes is the reverse sequence to removal, bearing in mind the following points:

- Before refitting the shoes, smear a trace of high-melting-point brake grease to the pivot areas of the wheel cylinder, brake adjuster and backplate.



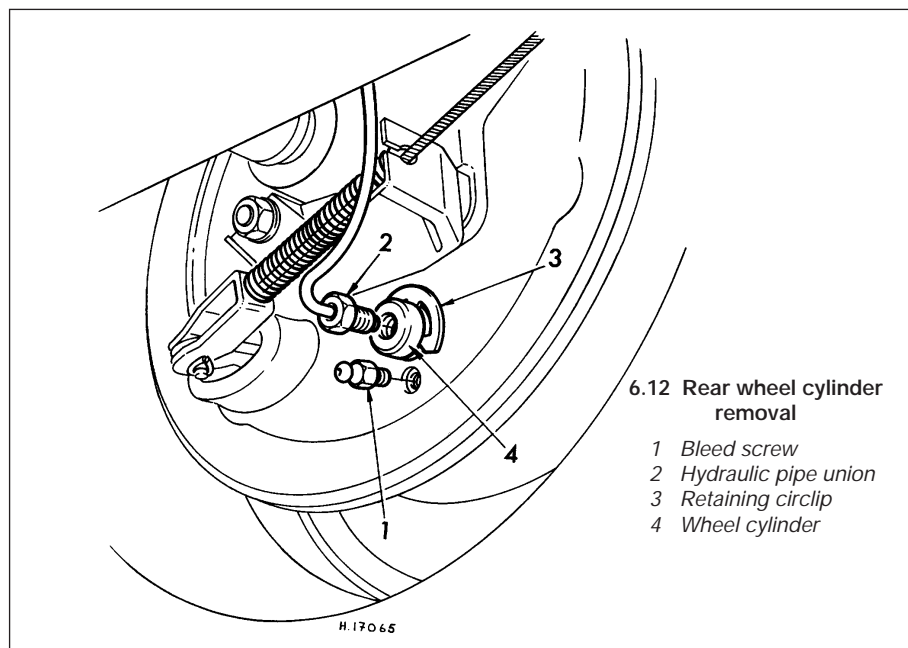
5.7a Withdraw the rear brake shoes from the brake adjuster pivots, detach the return spring . . .



5.7b . . . then lift off the front . . .



5.7c . . . and rear shoe from the handbrake lever and wheel cylinder



6.12 Rear wheel cylinder removal

- 1 Bleed screw
- 2 Hydraulic pipe union
- 3 Retaining circlip
- 4 Wheel cylinder

- b) Do not allow any grease or hydraulic fluid to come into contact with the brake shoe linings.
- c) Ensure that the shoes are refitted correctly and the return springs are in their correct holes. Ensure that the lower rear return spring does not rub on the wheel hub when refitted.
- d) Repeat all the above operations on the opposite rear brake.
- e) With the brake shoes assembled and drums refitted, adjust the brakes as described in Chapter 1.

**6 Drum brake wheel cylinder - removal, overhaul and refitting**



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid, and

to the warning at the beginning of Section 5 concerning the dangers of asbestos dust.

**Removal**

**Front wheel cylinder**

- 1 Remove the brake shoes from the relevant wheel as described in Section 5.
- 2 Thoroughly clean the rear of the backplate in the area around the wheel cylinder.
- 3 Clamp the flexible brake hose leading to the wheel cylinder with a proprietary brake hose clamp, or a self-gripping wrench with its jaws suitably protected. This will minimise hydraulic fluid loss when the hose or pipe is disconnected.
- 4 Disconnect the interconnecting brake pipe from the rear of the two wheel cylinders.
- 5 Undo and remove the two bolts securing each cylinder to the backplate.
- 6 If removing the cylinder containing the bleed screw, undo and remove the screw and lift off the cylinder.

7 If removing the cylinder containing the flexible brake hose, slacken the hose union at the wheel cylinder half a turn. Withdraw the wheel cylinder from the backplate and when it is clear, turn the cylinder anti-clockwise to unscrew it from the hose, taking care not to lose the copper sealing washer.

8 If the hose has not been clamped, suitably plug its end to prevent fluid loss and dirt ingress.

**Rear wheel cylinder**

9 Remove the brake shoes from the relevant wheel as described in Section 5.

10 Thoroughly clean the rear of the backplate in the area around the wheel cylinder.

11 Clamp the flexible hose located at the front of the rear suspension arm with a proprietary brake hose clamp, or a self-gripping wrench with its jaws suitably protected. This will minimise hydraulic fluid loss when the hydraulic pipe is disconnected.

12 Undo and remove the brake bleed screw and the hydraulic pipe union from the rear of the wheel cylinder (see illustration). Suitably protect the end of the brake pipe against dirt ingress.

13 Using a screwdriver, prise off the retaining circlip from the rear of the cylinder and then withdraw the wheel cylinder from the backplate.

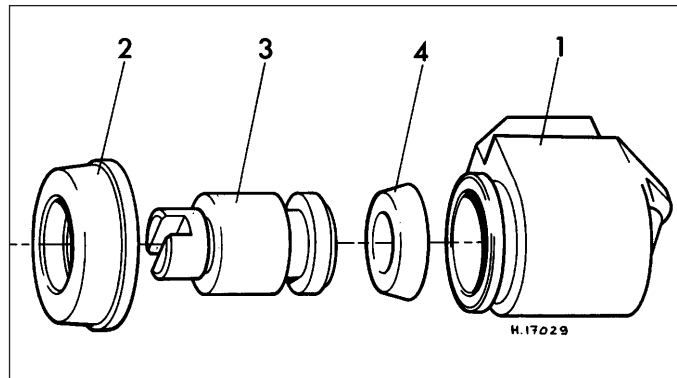
**Overhaul**

14 Thoroughly clean off the exterior of the cylinder, then prepare a clean working area on the bench.

15 Lift off the rubber dust cover(s) from the end of the wheel cylinder and withdraw the piston(s) and rubber seal(s), noting their precise location in relation to each other (see illustrations).

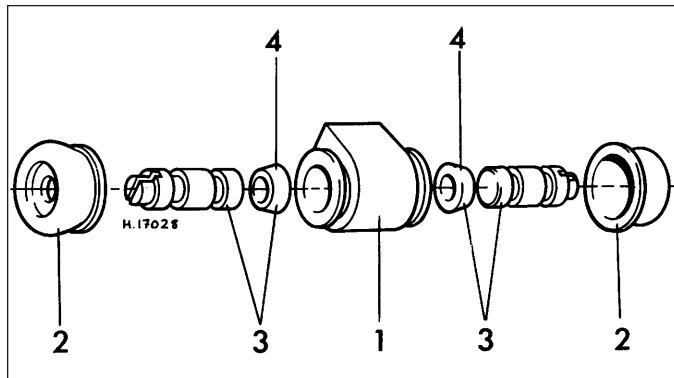
16 Thoroughly wash the components in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.

17 Carefully inspect the surface of the piston(s) and the internal bore of the cylinder body for scoring, pitting or other signs of wear. If any of these conditions are apparent the cylinder must be renewed.



6.15a Exploded view of a front wheel cylinder

- 1 Cylinder body
- 2 Dust cover
- 3 Piston
- 4 Rubber seal



6.15b Exploded view of a rear wheel cylinder

- 1 Cylinder body
- 2 Dust covers
- 3 Piston assemblies
- 4 Rubber seals



7.2 Extract the brake pad split pins from the caliper



7.3a Lift away the pad retaining spring plate . . .



7.3b . . . then withdraw the two brake pads

18 If the wheel cylinder is in a satisfactory condition, a new set of rubber seals should be obtained. Never re-use old seals as their condition is bound to be suspect.

19 To reassemble the wheel cylinder, immerse the piston and the new internal rubber seals in clean hydraulic fluid.

20 Carefully fit the seal(s) to the piston(s) with their lip or larger diameter facing away from the main part of the piston(s).

21 Slide the piston into the cylinder bore and then refit the dust cover(s) after first lubricating with the rubber grease supplied in the kit.

### Refitting

22 Refitting the front and rear wheel cylinders is the reverse sequence to removal, bearing in mind the following points:

- Where a wheel cylinder has been unscrewed from a flexible hose, use a new copper washer and ensure that the hose is not kinked when the cylinder is refitted.
- Ensure that the retaining spring circlip is correctly located in the groove in the rear wheel cylinder body.
- After fitting the wheel cylinder and refitting the brake shoes and drum, bleed the hydraulic system as described in Section 2. Providing the hoses were clamped as instructed, it should only be necessary to bleed the relevant wheel and not the entire system.



7.8 Smear high-temperature anti-seize grease to the pad backing plates



7.10 Spread the ends of the split pins to retain them in position

## 7 Disc brake pads - renewal



**Warning: Disc brake pads must be renewed on both front wheels at the same time - never renew the pads on only one wheel as uneven braking may result. Dust created by wear of the pads may contain asbestos, which is a health hazard. Never blow it out with compressed air and do not inhale any of it. DO NOT use petroleum-based solvents to clean brake parts. Use brake cleaner or methylated spirit only. DO NOT allow any brake fluid, oil or grease to contact the brake pads or disc. Also refer to the warning at the start of Section 2 concerning the dangers of hydraulic fluid.**

1 Chock the rear wheels then jack up the front of the car and support it on axle stands (see "Jacking and vehicle support"). Remove the front roadwheels.

2 Straighten the ends of the two brake pad retaining split pins then extract the split pins from the brake caliper (see illustration).

3 Lift away the pad retaining spring plate then, using a pair of pliers, carefully withdraw the two brake pads and (where fitted) their anti-rattle shims from the front of the caliper (see illustrations).

4 Carefully inspect the pads and renew them if the friction material has worn down to less than the minimum specified thickness.

5 Thoroughly clean all traces of dirt and dust from the recesses in the caliper, in which the brake pads lie, and the exposed face of each piston.

6 If new brake pads are being fitted it will be necessary to move the pistons back into the caliper to accommodate the new, thicker pads. This will cause a quantity of hydraulic fluid to be returned to the master cylinder reservoir, causing the fluid level to rise and possibly overflow. To protect the surrounding paintwork, remove the reservoir filler cap and place a large rag beneath the reservoir to absorb any fluid that may overflow. Alternatively, siphon off a quantity of fluid from the reservoir first.



**An ideal way to remove fluid from the master cylinder reservoir is to use a clean syringe or an old poultry baster.**

7 Using a flat bar or large screwdriver, lever the piston in each half of the caliper, back into its cylinder as far as it will go.

8 Smear a small amount of high-temperature anti-seize grease onto the edges and rear of the pad backing plates which contact the calipers and pistons (see illustration). Do not allow any grease onto the friction material of the brake pads.

9 Check that the cutaway face of each piston is facing upwards and then place the anti-rattle shims in position.

10 Slide in the brake pads, refit the pad retaining spring plate, then secure the assembly using new split pins. Spread the ends of the split pins to retain them in position (see illustration).

11 Depress the brake pedal several times (it will probably go right to the floor on the first stroke), to centralise the pads, and then check that the disc turns reasonably freely with the pedal released.

12 Repeat the above operations on the other front brake.

13 Refit the roadwheels and lower the car to the ground.



### 8 Disc brake caliper - removal, overhaul and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid, and to the warning at the beginning of Section 7 concerning the dangers of asbestos dust.

#### Removal

- 1 Remove the disc brake pads as described in Section 7.
- 2 If the caliper is being removed for overhaul, slowly and carefully depress the brake pedal to bring the caliper pistons nearly into contact with the brake disc. This will assist subsequent removal of the pistons.
- 3 Using a proprietary brake hose clamp, or a self-gripping wrench with its jaws suitably protected, clamp the flexible brake hose leading to the caliper. This will eliminate any hydraulic fluid loss when the hose is disconnected.
- 4 Slacken the flexible hose union on the side of the caliper half a turn.
- 5 Undo and remove the two bolts securing the caliper to the swivel hub, and then withdraw the caliper forward and off the hub.
- 6 With the caliper clear of the hub and brake disc, support the flexible hose and turn the caliper anti-clockwise to unscrew it. With the hose disconnected, recover the copper sealing washer and plug its end to prevent dirt ingress.

#### Overhaul

- 7 Carefully withdraw the two pistons one at a time from the caliper body. Do not attempt to separate the caliper halves.
- 8 Taking great care not to scratch the cylinder walls of the caliper, hook out the dust seal and piston seal from each caliper cylinder.
- 9 Thoroughly clean the caliper and pistons in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.
- 10 Inspect the pistons and caliper bores in the caliper for wear, score marks or surface pitting, and if evident renew the complete caliper assembly.
- 11 If the caliper and pistons are in a satisfactory condition, a new set of seals should be obtained. *Never re-use old seals.*
- 12 Lubricate the pistons, seals and the cylinder bores in the caliper with clean hydraulic fluid.
- 13 Insert the piston seal into the groove in the caliper and then insert the piston with the cutaway facing upwards.
- 14 Push the piston into its cylinder until 8.0 mm remains protruding.
- 15 Now carefully insert the dust seal into the outer groove in the caliper and push it squarely into place.
- 16 Repeat paragraphs 13, 14 and 15 for the other piston.

### Refitting

17 Refitting the brake caliper is the reverse sequence to removal, bearing in mind the following points:

- a) Use a new copper washer on the flexible brake hose and ensure that with the caliper in position, the hose is not kinked or twisted.
- b) Tighten the caliper retaining bolts to the specified torque.
- c) Refit the brake pads as described in Section 7 then bleed the hydraulic system as described in Section 2. If the flexible hose was clamped as described, it should not be necessary to bleed the entire system.

### 9 Brake disc - inspection, removal and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 7 concerning the dangers of asbestos dust.

#### Inspection

**Note:** If a disc requires renewal, BOTH discs should be renewed at the same time to ensure even and consistent braking. New brake pads should also be fitted.

- 1 Remove the disc brake pads as described in Section 7.
- 2 Inspect the disc friction surfaces for cracks or deep scoring (light grooving is normal and may be ignored). A cracked disc must be renewed; a scored disc can often be reclaimed by machining provided that the thickness is not significantly reduced. Consult your Rover dealer as to the best course of action if deep scoring is evident.
- 3 Check the disc run-out using a dial test indicator with its probe positioned near the outer edge of the disc. If the run-out exceeds the figures given in the *Specifications*, machining may be possible, otherwise disc renewal will be necessary.



**HiNT** If a dial test indicator is not available, check the run-out by positioning a fixed pointer near the outer edge, in contact with the disc face. Rotate the disc and measure the maximum displacement of the pointer with feeler blades.

4 Excessive disc thickness variation can also cause judder. Check this using a micrometer. No actual thickness variation figures are provided by the manufacturer, but as a general guide, 0.010 mm should be considered a maximum.

#### Removal

5 If not already done, chock the rear wheels then jack up the front of the car and support it

on axle stands (see *"Jacking and vehicle support"*). Remove the front roadwheel.

6 Extract the split pin from the driveshaft retaining nut. If the brake pads have not been removed, have an assistant firmly depress the brake pedal, while you undo and remove the driveshaft nut using a socket and extension bar. Remove the split-collar located behind the driveshaft nut. If the brake pads have already been removed for disc inspection, temporarily refit them to allow the driveshaft nut to be undone or, alternatively, fabricate a home-made tool to prevent the hub flange rotating when undoing the nut (see Chapter 8, Section 2). Note that on later models, the driveshaft retaining nut is extremely tight and it may be beneficial to use the home-made tool even if the pads are still fitted.

7 Undo and remove the brake caliper retaining bolts. Lift off the caliper complete with brake pads (where applicable), and with the brake hose still attached, and tie it out of the way from a convenient place under the wheel arch. Take care not to stretch the flexible hose.

8 Withdraw the front hub flange and brake disc from the swivel hub and driveshaft.

9 To separate the disc from the hub flange, first mark the two components to ensure that they are refitted in the same position.

10 Undo and remove the bolts securing the hub flange to the disc and lift away the disc.

#### Refitting

11 Ensure that the mating surfaces between disc and hub flange are thoroughly clean then place the disc in position and refit the retaining bolts. If the original disc is being refitted, ensure that the marks made on removal are aligned.

12 Locate the hub flange and disc assembly over the driveshaft and in position on the swivel hub. Smear engine oil over the driveshaft threads and fit the split-collar and driveshaft retaining nut. Tighten the nut finger tight only at this stage.

13 Refit the brake caliper and secure with the two bolts tightened to the specified torque.

14 If removed, refit the brake pads as described in Section 7.

15 Using the same procedure as for removal to prevent the hub rotating, tighten the nut to the specified torque. Note that there are two different torque settings for the driveshaft nut; one for driveshafts with multiple split pin holes, and a higher setting for driveshafts with a single split pin hole. Tighten the nut further to align the split pin holes in the driveshaft and nut, then secure the nut with a new split pin.

16 Refit the roadwheel and lower the car to the ground.





10.7 Removing the handbrake cable from the moving sector



10.10 Pinching the ends of the moving sector to retain the handbrake cable

## 10 Handbrake cable - removal and refitting



### Early models

#### Removal

- 1 Chock the front wheels then jack up the rear of the car and support it on axle stands (see "Jacking and vehicle support"). Remove the rear roadwheel and ensure that the handbrake is off.
- 2 From inside the car, undo and remove the cable adjusting nut at the handbrake lever, then pull the cable out of the lever trunnion. Slide the two washers and tension spring off the threaded end of the cable.
- 3 Lift up the carpets to expose the cable

guide plates located at the point where the cable passes through the floor.

- 4 Engage the help of an assistant to hold the two nuts from underneath the car while the two cable guide retaining screws are removed from above. Lift off the guide and sealing pad.
- 5 From beneath the car, pull the end of the cable through the opening in the floor and out of the passenger compartment.
- 6 Bend back the tags slightly on the guide channel located on the forward crossmember of the rear subframe. Lift the cable out of the guide channel.
- 7 Similarly bend up the pinched ends of the moving sector located at the front of the rear suspension arm. Lift the cable and the locating peg out of the sector (see illustration), and then pull the disconnected end of the cable through the opening in the side of the subframe.

8 At the other end of the cable, extract the split pin and withdraw the clevis pin securing the cable end to the handbrake operating arm.

9 Release the cable from the abutment bracket at the rear of the brake backplate and lift the cable off the car.

#### Refitting

10 Refitting the cable is the reverse sequence to removal, bearing in mind the following points:

- a) With the cable in position, pinch the ends of the moving sector and subframe guide channel slightly to retain the cable (see illustration).
- b) Ensure that the guide channel in the subframe is well lubricated.
- c) Adjust the handbrake as described in Chapter 1 on completion.

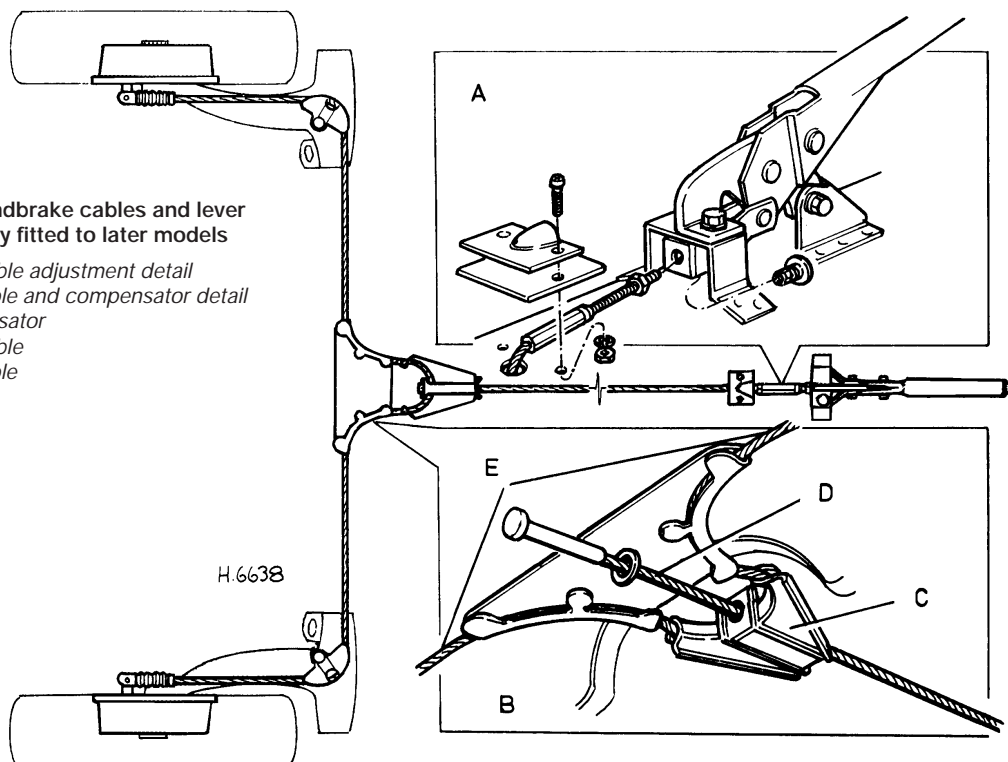
### Later models - front cable

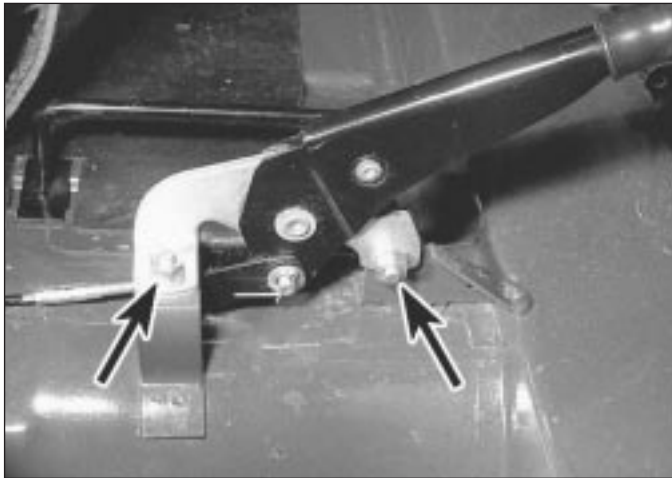
#### Removal

- 11 Chock the front wheels then jack up the rear of the car and support it on axle stands (see "Jacking and vehicle support"). Remove the rear roadwheel and ensure that the handbrake is off.
- 12 Tilt the front seats forward and lift up the carpet around the handbrake lever.
- 13 Slacken the locknut, and then unscrew the cable adjusting nut until the cable can be withdrawn from the lever assembly (see illustration).

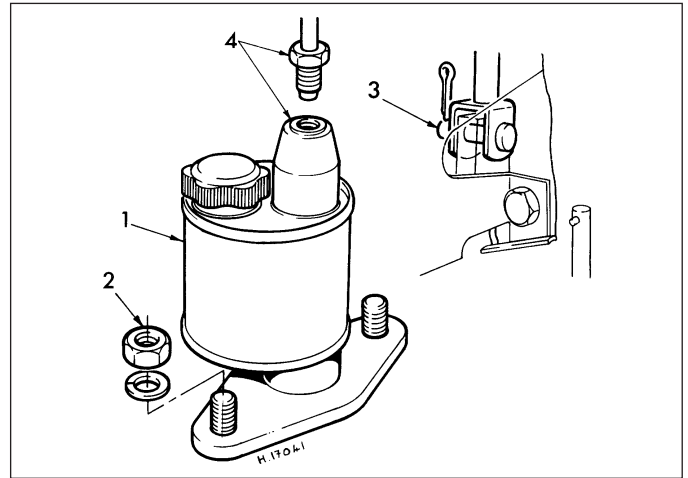
10.13 Handbrake cables and lever assembly fitted to later models

- A Front cable adjustment detail
- B Rear cable and compensator detail
- C Compensator
- D Front cable
- E Rear cable





11.2 Handbrake lever retaining nuts and bolts



12.2 Removal of the single circuit master cylinder

1 Master cylinder  
2 Retaining nuts

3 Pushrod-to-brake pedal attachment  
4 Hydraulic pipe union

14 Undo and remove the screws securing the cable guide plate to the floor. Have an assistant hold the two nuts from under the car as the screws are undone.

15 Lift off the guide plate and pass the cable through the hole in the floor.

16 Pull the cable rearwards and remove it from the compensator on the rear cable.

#### Refitting

17 Refitting is the reverse sequence to removal. Adjust the handbrake as described in Chapter 1 on completion.

#### Later models - rear cable

#### Removal

18 Remove the front cable as described previously.

19 Extract the split pins and withdraw the clevis pins securing the cable ends to the handbrake operating arms at the rear of each brake backplate. Release the cable and tension springs from the abutment brackets on the backplate.

20 Bend back the tags slightly on the guide channels located on the forward crossmember of the rear subframe.

21 Similarly bend up the pinched ends of the moving sectors located at the front of each rear suspension arm. Lift the cable and locating pegs out of the sectors, pull the disconnected ends of the cable through the openings in the side of the subframe, and lift away the cable complete with compensator.

#### Refitting

22 Refitting the rear cable is the reverse sequence to removal bearing in mind the following points.

- a) With the cable in position pinch the ends of the moving sectors and subframe guide channels slightly to retain the cable.
- b) Ensure that the guide channels in the subframe are well lubricated.

### 11 Handbrake lever - removal and refitting



#### Removal

1 On early models lift up the front seats, unscrew the two handbrake cable adjusting nuts and pull the cables out of the trunnion on the lever. On later models slacken the locknut, unscrew the cable adjusting nut and withdraw the cable.

2 Undo and remove the two nuts, bolts and spring washers securing the handbrake lever to the bracket on the floor (see illustration). Lift off the lever and withdraw it from the car.

3 The handbrake lever cannot be dismantled, and if worn or faulty must be renewed as a complete assembly.

#### Refitting

4 Refitting is the reverse sequence to removal. Adjust the handbrake as described in Chapter 1 on completion.

### 12 Master cylinder (single circuit system) - removal, overhaul and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

#### Removal

1 From inside the car release the heater air inlet ducting from the side of the heater unit and wheel arch. Remove the ducting from under the parcel shelf.

2 Extract the split pin and withdraw the clevis pin securing the master cylinder pushrod to the brake pedal (see illustration).

3 Working in the engine compartment, unscrew the brake pipe union from the top of the master cylinder and carefully pull the pipe clear.

4 Undo and remove the two nuts and spring washers securing the master cylinder to the bulkhead and lift off the cylinder.

#### Overhaul

5 Remove the filler cap from the master cylinder then drain and discard the hydraulic fluid from the reservoir.

6 With the cylinder on the bench, withdraw the rubber dust cover and slide it off over the end of the pushrod (see illustration).

7 Using circlip pliers, extract the circlip and lift off the pushrod and dished washer.

8 Tap the master cylinder body on a block of wood until the piston emerges from the end of the cylinder bore.

9 Withdraw the piston from the cylinder, followed by the piston washer, main cup seal, spring retainer, spring and non-return valve.

10 Lay the parts out in the order of removal, and then very carefully remove the secondary cup seal from the piston by stretching it over the end of the piston.

11 Wash the components in clean hydraulic fluid or methylated spirit and dry with a lint-free rag.

12 Examine the cylinder bore and piston carefully for signs of scoring, or wear ridges. If these are apparent, renew the complete master cylinder. If the condition of the components appears satisfactory, a new set of rubber seals must be obtained. *Never reuse old seals* as they will have deteriorated with age even though this may not be evident during visual inspection.

13 Begin reassembly by thoroughly lubricating the internal components and the cylinder bore in clean hydraulic fluid.

### 13 Tandem master cylinder (dual circuit system) - identification and modifications

#### Identification

1 Four different versions of tandem brake master cylinder have been fitted to Mini models covered by this manual. The removal, refitting and overhaul procedures for the four versions are distinctly different and it is important to correctly identify the unit being worked on before proceeding.

2 For identification purposes only, the master cylinders will be referred to in this Chapter as types 1, 2, 3 or 4. Identification is as follows:

*Type 1: Vertically mounted and incorporating a circular plastic transparent fluid reservoir with large flat filler cap (see illustration). Separate pressure differential warning actuator located on engine compartment bulkhead.*

*Type 2: Vertically mounted and incorporating a rectangular plastic transparent fluid reservoir with small flat filler cap possibly with brake fluid level warning indicator. Upper and lower hydraulic pipe union nuts of the same size. Pressure differential warning actuator integral with master cylinder, operating a brake failure warning switch fitted to the side of the cylinder body (see illustration).*

*Type 3: Vertically mounted and incorporating a rectangular plastic transparent fluid reservoir with brake fluid level warning indicator in the filler cap. Upper hydraulic pipe union nut larger than the lower nut. A yellow plastic identification band should also appear around the cylinder body (see illustration). Fitted to models manufactured from November 1985 to 1989 and as a retro-fit replacement for type 2 units.*

*Type 4: Horizontally mounted on the front of the vacuum servo unit. Fitted to models manufactured from 1989 onwards (see illustration).*

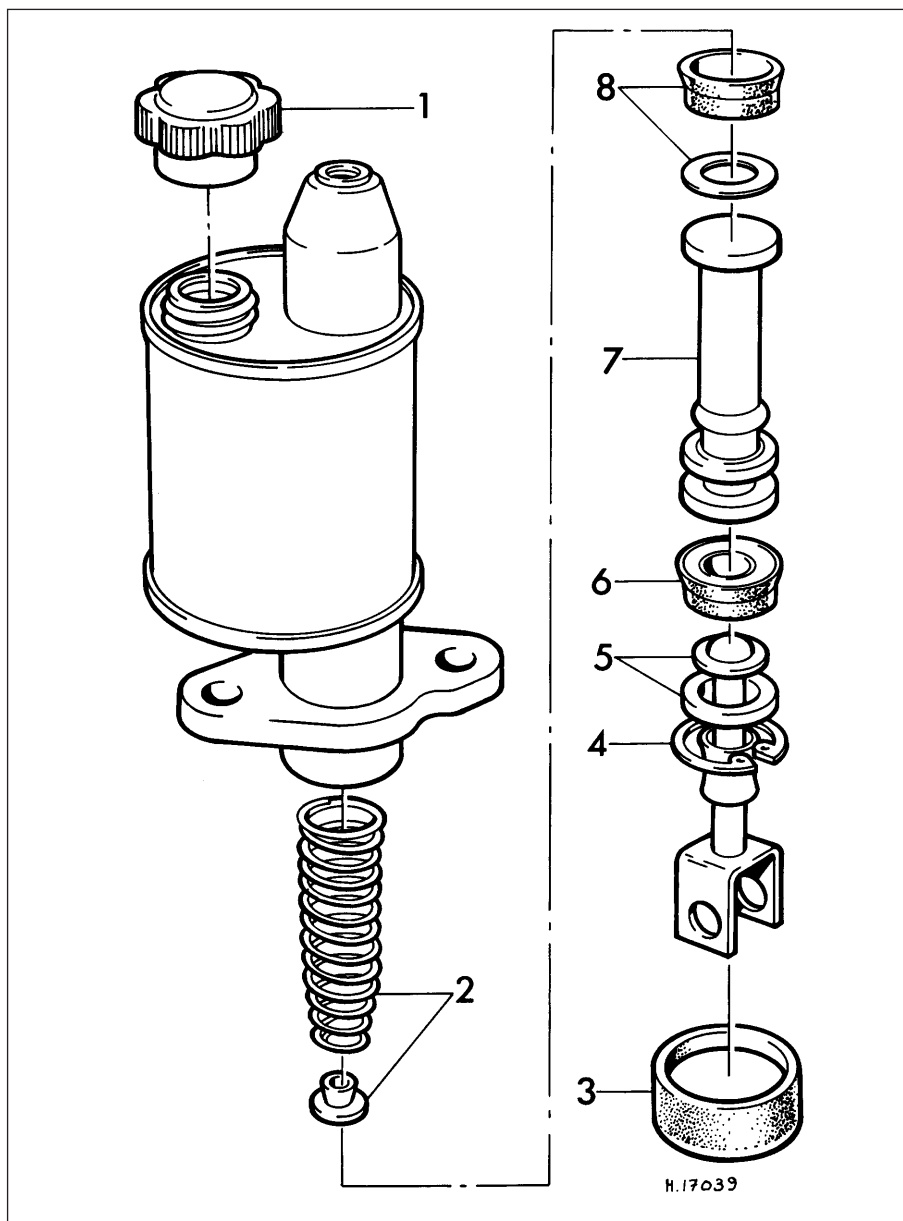
#### Modifications

3 In November 1985, the type 3 tandem master cylinder with a revised front/rear split was introduced to replace the type 2. This new cylinder has a stepped bore, and the primary and secondary circuits have been reversed.

4 Should a type 2 master cylinder require renewal, a type 3 unit will be supplied by Rover dealers.

5 To fit the type 3 cylinder to pre-November 1985 vehicles, two modified brake pipes will be required and, on vehicles without a brake fluid level warning indicator, a conversion wiring loom will also be required. These modified components should be available from Rover dealers.

6 To fit a type 3 master cylinder to pre-November 1985 vehicles, proceed as follows.



12.6 Exploded view of the single circuit master cylinder

- |                              |                                   |
|------------------------------|-----------------------------------|
| 1 Filler cap                 | 5 Pushrod and stop washer         |
| 2 Spring and spring retainer | 6 Secondary cup seal              |
| 3 Dust cover                 | 7 Piston                          |
| 4 Circlip                    | 8 Piston washer and main cup seal |

14 Using fingers only, place the secondary cup seal in position on the piston with the lip of the cup facing the opposite (drilled) end of the piston.

15 Position the non-return valve over the larger diameter of the spring and the spring retainer over the smaller diameter, and place this assembly into the cylinder bore, larger diameter first.

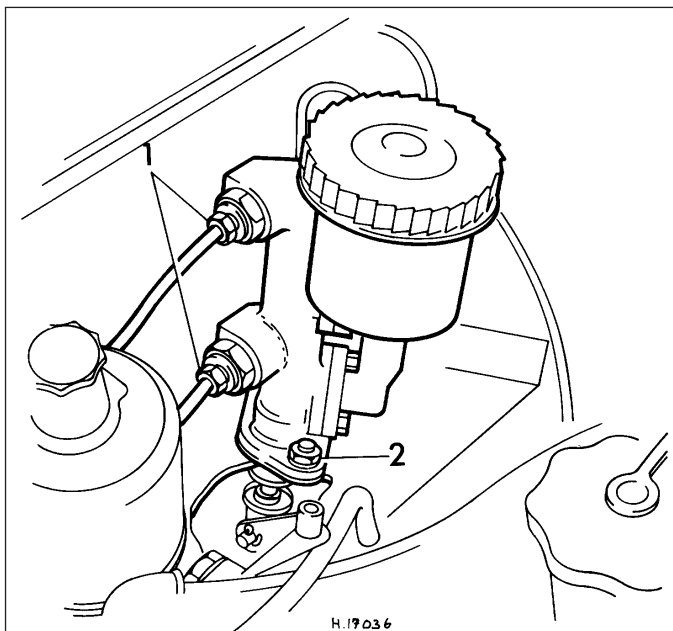
16 Now insert the main cup seal into the cylinder bore, lip end first followed by the washer.

17 Insert the piston assembly into the cylinder bore followed by the pushrod, dished washer and circlip. Ensure that the circlip fully enters its groove.

18 Lubricate a new dust cover with rubber grease and stretch it over the pushrod and into position on the end of the cylinder.

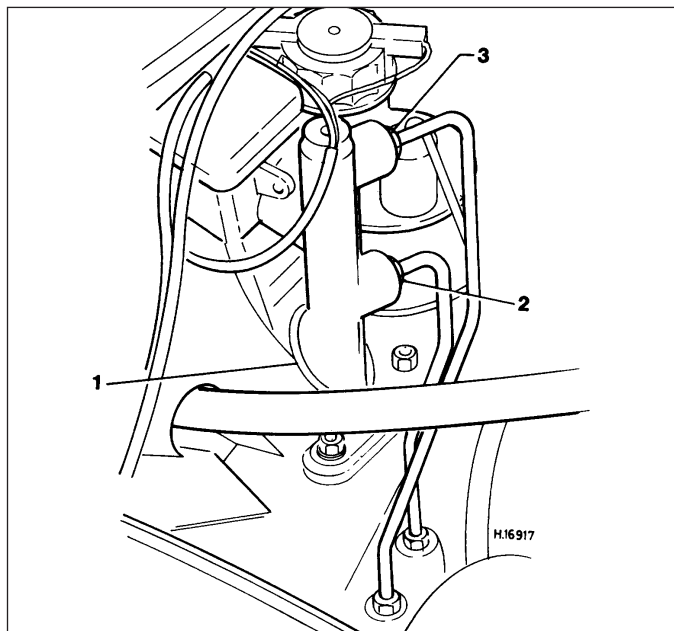
#### Refitting

19 Refitting is the reverse sequence to removal. Bleed the complete hydraulic system as described in Section 2 on completion.



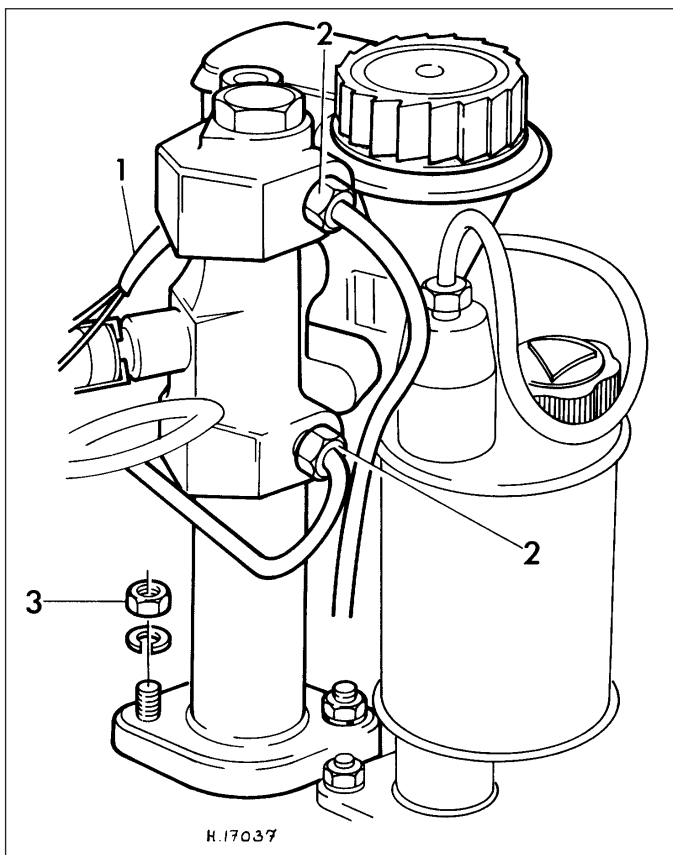
**13.2a Identification and removal of the type 1 tandem master cylinder**

- 1 Hydraulic pipe unions      2 Retaining nuts



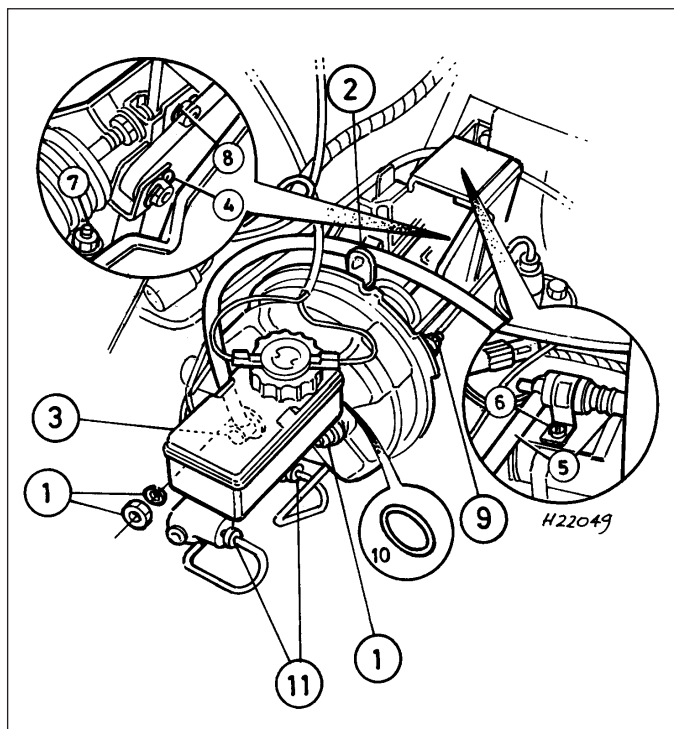
**13.2c Identification and removal of the type 3 tandem master cylinder**

- 1 Yellow band      2 Larger pipe union      3 Smaller pipe union



**13.2b Identification and removal of the type 2 tandem master cylinder**

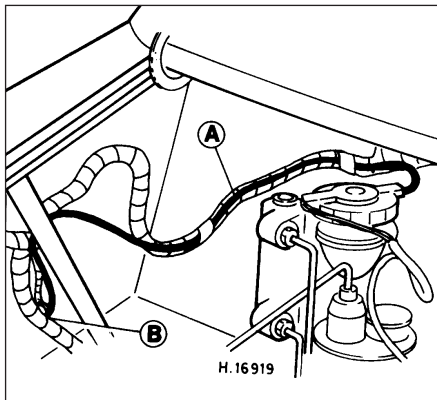
- 1 Electrical wiring to failure switch      2 Hydraulic pipe unions  
3 Retaining nuts



**13.2d Identification and removal of the type 4 tandem master cylinder**

- 1 Master cylinder mounting nuts      7 Servo mounting bracket nuts  
2 Vacuum hose retaining clip      8 Servo pushrod clevis pin  
3 One-way vacuum valve      9 Servo-to-mounting bracket nuts  
4 Brake pedal clevis pin      10 O-ring  
5 Anti-run-on valve hoses (where fitted)      11 Brake pipe union nuts  
6 Anti-run-on valve (where fitted)





13.11 Braking system conversion wiring loom details

A Loom B Earth screw

7 Remove the master cylinder, as described in Section 15. **Note:** On vehicles equipped with a fluid level indicator, disconnect the wiring connectors from the switch on the reservoir filler cap.

8 Remove the existing hydraulic pipes from the pressure-reducing valve (which run to the brake master cylinder).

9 Fit the new pipes to the pressure reducing valve.

10 Fit the new brake master cylinder, which is a reversal of removal, then connect the new pipes to it.

11 To fit the wiring conversion loom, first cut the connector from the end of the two black and white wires removed from the brake warning switch on the old cylinder (see illustration).

12 Join the two wires together, fit a Lucar connector, and connect it to one terminal of the fluid level warning switch on the new master cylinder.

13 Using black cable, make up an earth lead with a Lucar connector at one end and an eyelet at the other.

14 The earth lead should be 533.0 mm long, and is connected to the other connector on the fluid level warning switch, and routed along the wiring loom in the engine bay to the existing earth screw.

15 Fill and bleed the hydraulic system, as described in Section 2, and check the operation of both the brake warning light and the low fluid level warning light.

#### 14 Tandem master cylinder (type 1) - removal, overhaul and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

#### Removal

1 Place a cloth around the master cylinder to catch any spilled fluid then unscrew the hydraulic pipe unions from the master cylinder

and carefully pull the pipes clear. Plug or tape over the disconnected unions to prevent dirt entry.

2 Undo and remove the two nuts and spring washers securing the master cylinder to the bulkhead. Lift off the master cylinder, leaving the pushrod attached to the brake pedal.

#### Overhaul

3 Remove the filler cap from the master cylinder, then drain and discard the hydraulic fluid from the reservoir.

4 Mount the master cylinder in a vice with protected jaws, so that the mouth of the cylinder bore is uppermost.

5 Slide off the rubber boot, compress the

return spring and, using a small screwdriver, remove the Spirolex ring from its groove in the primary piston (see illustration). Take care not to distort the coils of the ring or score the bore of the cylinder.

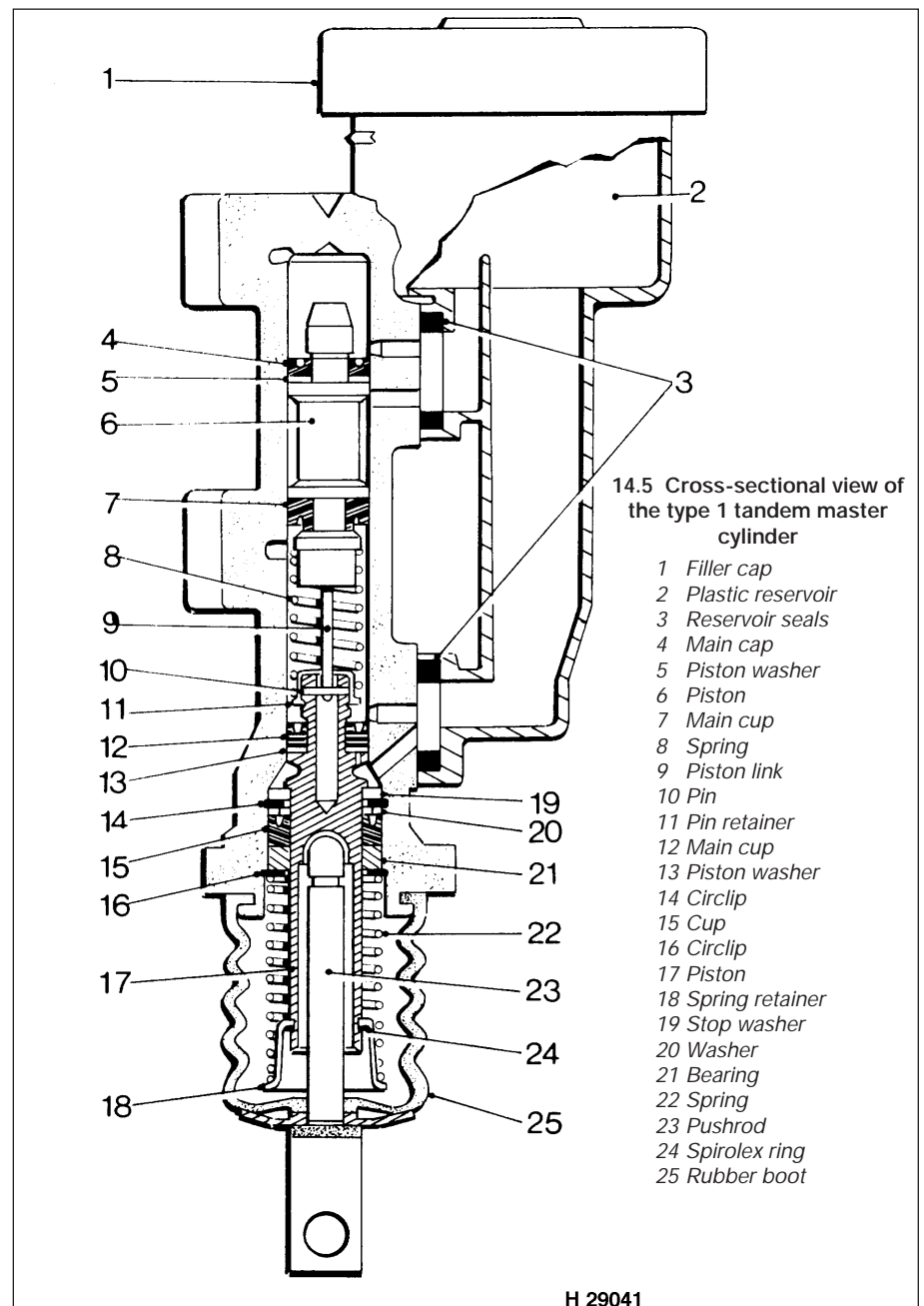
6 Using a pair of circlip pliers, remove the piston retaining circlip.

7 Carefully move the piston up and down in the bore so as to free the nylon guide bearing and cap seal. Lift away the guide bearing seal.

8 Lift away the plain washer.

9 Using a pair of circlip pliers, remove the inner circlip.

10 The primary and secondary piston assembly, complete with the stop washer, may now be withdrawn from the cylinder bore.



14.5 Cross-sectional view of the type 1 tandem master cylinder

- 1 Filler cap
- 2 Plastic reservoir
- 3 Reservoir seals
- 4 Main cap
- 5 Piston washer
- 6 Piston
- 7 Main cup
- 8 Spring
- 9 Piston link
- 10 Pin
- 11 Pin retainer
- 12 Main cup
- 13 Piston washer
- 14 Circlip
- 15 Cup
- 16 Circlip
- 17 Piston
- 18 Spring retainer
- 19 Stop washer
- 20 Washer
- 21 Bearing
- 22 Spring
- 23 Pushrod
- 24 Spirolex ring
- 25 Rubber boot

H 29041

## 9•14 Braking system

- 11 Lift away the stop washer.
- 12 Compress the spring that separates the two pistons then, using a small diameter parallel pin punch, drive out the roll pin that retains the piston link.
- 13 Inspect and note the location of the rubber cups (look for the moulded indentations) then remove the cups and washers from the pistons.
- 14 Undo and remove the four bolts that secure the plastic reservoir to the body and lift away the reservoir.
- 15 Recover the two reservoir sealing rings.
- 16 Unscrew and remove the hydraulic pipe connection adapters, discard the copper gaskets and recover the spring and trap valves.
- 17 Wash all parts in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.
- 18 Examine the bore of the cylinder carefully for any signs of scores or ridges. If this is found to be smooth all over, new seals can be fitted. If, however, there is any doubt of the condition of the bore, then a new cylinder must be obtained and fitted. *Never re-use old seals* as they will have deteriorated with age even though this may not be evident during visual inspection.
- 19 Reassembly of the master cylinder is the reverse sequence to removal, but the

following additional points should be noted:

- a) *All components should be assembled wet by dipping in clean brake fluid.*
- b) *Locate the piston washer over the head of the secondary piston, convex surface first, then carefully ease the secondary cup over the piston and seat it with its flat surface against the washer.*
- c) *Fit new copper gaskets to the connection adapters.*

### Refitting

20 Refitting is the reverse sequence to removal. On completion, bleed the complete hydraulic system as described in Section 2.

## 15 Tandem master cylinder (type 2) - removal, overhaul and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

### Removal

1 From inside the car, release the heater air inlet ducting from the side of the heater unit and wheel arch. Remove the ducting from under the parcel shelf.

2 Extract the split pin and withdraw the clevis pin securing the master cylinder pushrod to the brake pedal.

3 Working in the engine compartment, disconnect the wiring connector from the brake failure warning switch on the master cylinder body.

4 Place a cloth around the master cylinder to catch any spilled fluid then unscrew the hydraulic pipe unions from the side of the master cylinder body and carefully pull the pipes clear. Plug or tape over the disconnected unions to prevent dirt entry.

5 Unscrew the two nuts securing the master cylinder to the bulkhead and lift the unit off.

### Overhaul

6 Remove the filler cap from the master cylinder, and drain and discard the hydraulic fluid from the reservoir.

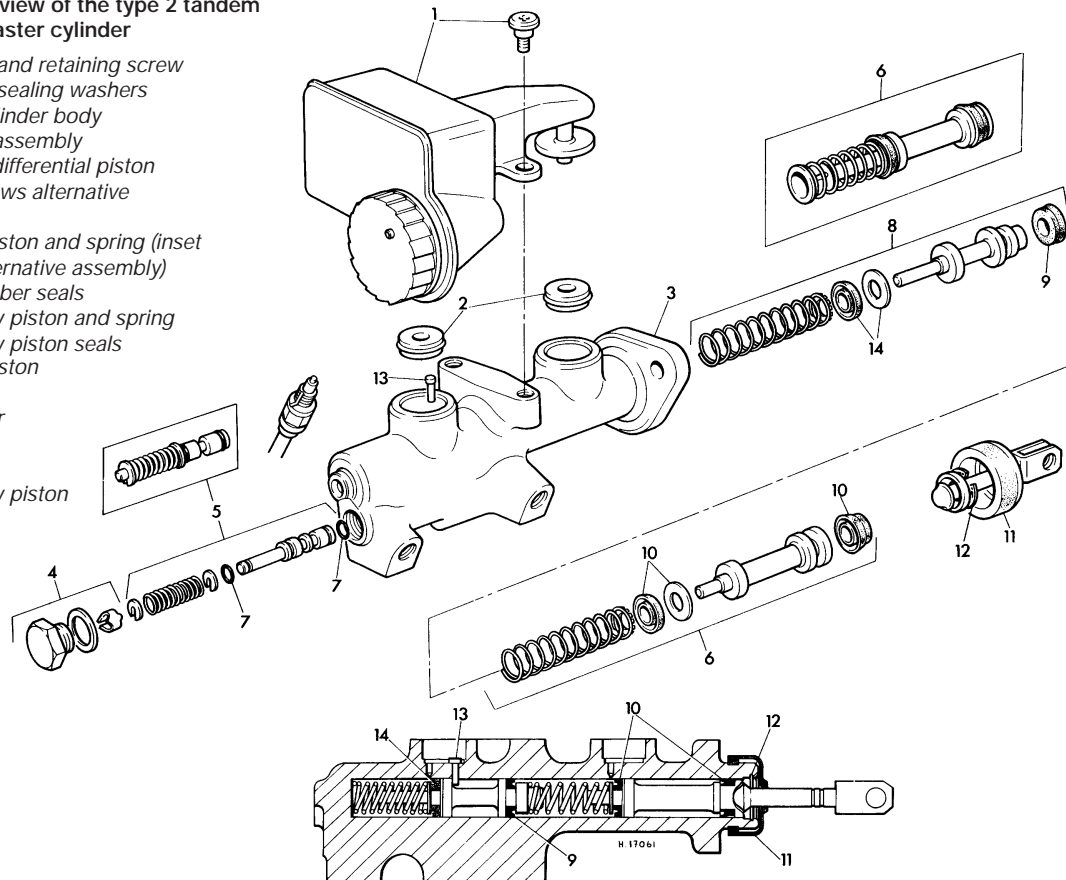
7 Mount the cylinder in a vice with protected jaws, so that the reservoir is uppermost.

8 Unscrew the two reservoir retaining screws and lift the reservoir off the master cylinder body (see illustration). Carefully withdraw the two reservoir sealing washers from the outlets.

9 Push in the pushrod as far as possible, and using pliers, extract the secondary piston stop pin from its recess.

### 15.8 Exploded view of the type 2 tandem master cylinder

- 1 Reservoir and retaining screw
- 2 Reservoir sealing washers
- 3 Master cylinder body
- 4 End plug assembly
- 5 Pressure differential piston (insert shows alternative assembly)
- 6 Primary piston and spring (inset shows alternative assembly)
- 7 Piston rubber seals
- 8 Secondary piston and spring
- 9 Secondary piston seals
- 10 Primary piston seals
- 11 Dust cover
- 12 Circlip
- 13 Stop pin
- 14 Secondary piston seals



10 Release the pushrod rubber boot from the end of the cylinder, push the pushrod in and extract the retaining circlip. Now lift away the pushrod assembly.

11 Remove the master cylinder from the vice, tap it on a block of wood and withdraw the primary and secondary piston assemblies from the cylinder bore.

12 Unscrew the brake failure switch from the cylinder body.

13 Unscrew the end plug and washer, then remove the distance piece and pressure differential piston assembly.

14 Note the position and direction of fitting of the rubber seals on the piston assemblies, and then carefully remove them.

15 Wash all the parts in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.

16 Examine the bore of the master cylinder carefully for any signs of scores or ridges. If this is found to be smooth all over, new seals can be fitted. If, however, there is any doubt

about the condition of the bore, then a new cylinder must be obtained and fitted. *Never re-use old seals*, as they will have deteriorated with age even though this may not be evident during visual inspection.

17 Reassembly of the master cylinder is the reverse sequence to removal, but the following additional points should be noted:

- Thoroughly lubricate all components in clean hydraulic fluid and assemble them wet
- Refit the seals onto the pistons using fingers only, and ensure that they are fitted the correct way round
- When refitting the secondary piston assembly, push the piston down the bore using a soft metal rod and insert the stop pin. The primary piston and remaining components can then be fitted

### Refitting

18 Refitting is the reverse sequence to removal. On completion, bleed the complete hydraulic system as described in Section 2.

## 16 Tandem master cylinder (type 3) - removal, overhaul and refitting



Removal, refitting and overhaul of the type 3 master cylinder is essentially the same as for the type 2 unit and reference should be made to the procedures contained in Section 15. Bear in mind also the differences between the two types outlined in Section 13.

## 17 Tandem master cylinder (type 4) - removal, overhaul and refitting



**Note:** Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

### Removal

1 If necessary, for improved access to the front and rear bleed screws, jack up the front and rear of the car and support it on axle stands (see "Jacking and vehicle support").

2 Connect a bleed tube to both the front caliper and rear wheel cylinder bleed screws on the right-hand side, and place the ends of the tubes in suitable containers.

3 Open both bleed screws and depress the brake pedal until the master cylinder is completely empty, then tighten the screws.

4 Disconnect the low fluid level warning light wiring from the fluid reservoir filler cap.

5 Place a cloth around the master cylinder to catch any spilled fluid then unscrew the hydraulic pipe unions from the master cylinder and carefully pull the pipes clear. Plug or tape over the disconnected unions to prevent dirt entry.

6 Unscrew the mounting nuts securing the master cylinder to the vacuum servo unit, then withdraw it from the engine compartment, taking care not to spill any brake fluid on the bodywork.

7 Remove the O-ring from the recess in the master cylinder.

### Overhaul

8 Remove the filler cap from the master cylinder, and drain and discard the hydraulic fluid from the reservoir.

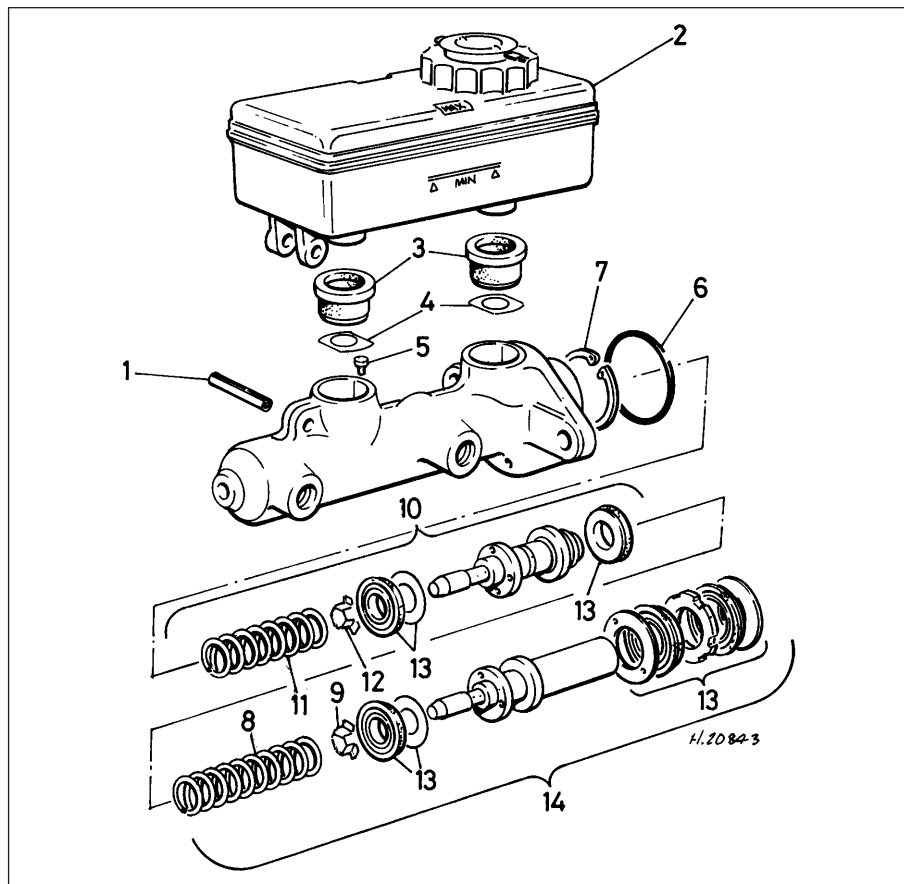
9 Mount the cylinder in a vice with protected jaws, so that the reservoir is uppermost.

10 Tap out the retaining roll pin and lift the reservoir off the master cylinder body (see illustration). Carefully withdraw the two reservoir sealing washers from the outlets followed by the metal seating washers.

11 Push in the primary piston and, using pliers, extract the secondary piston stop pin from its recess.

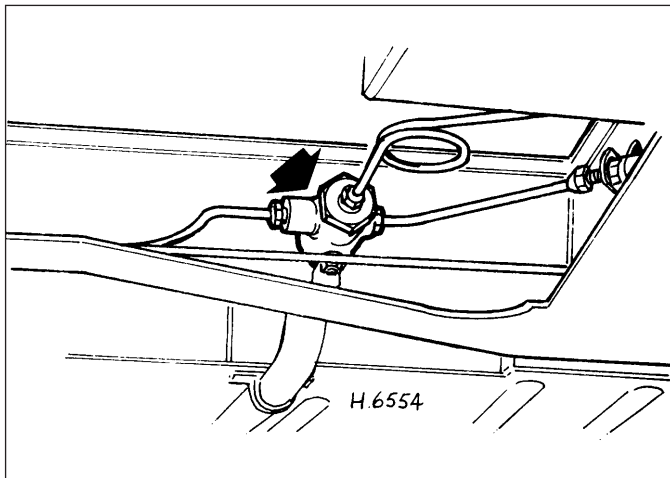
12 Extract the retaining circlip from the end of the master cylinder bore.

13 Remove the master cylinder from the vice, tap it on a block of wood and withdraw the primary and secondary piston assemblies from the cylinder bore.

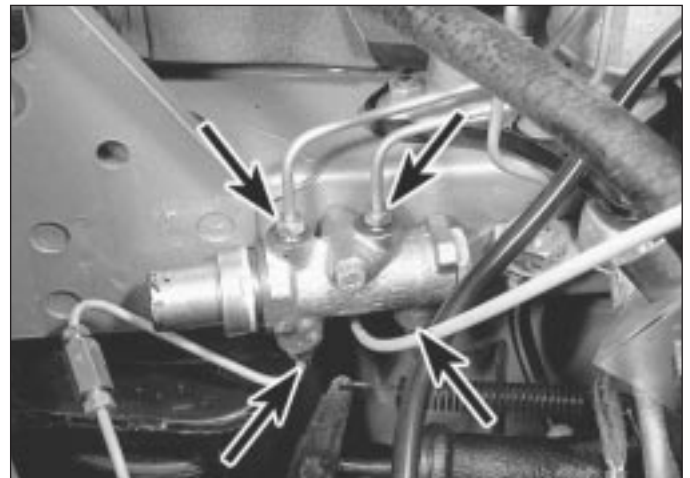


17.10 Exploded view of the type 4 tandem master cylinder

- |                             |                                |
|-----------------------------|--------------------------------|
| 1 Roll pin                  | 8 Primary spring               |
| 2 Brake fluid reservoir     | 9 Spring retainer              |
| 3 Sealing washers           | 10 Secondary piston components |
| 4 Metal seating washers     | 11 Secondary spring            |
| 5 Secondary piston stop-pin | 12 Spring retainer             |
| 6 O-ring                    | 13 Seal and washer             |
| 7 Circlip                   | 14 Primary piston components   |



18.3 Location of pressure regulating valve on rear subframe



19.2 Pressure reducing valve hydraulic pipe unions

14 Note the position and direction of fitting of the rubber seals on the piston assemblies, then carefully remove them.

15 Wash all the parts in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.

16 Examine the bore of the master cylinder carefully for any signs of scores or ridges. If this is found to be smooth all over, new seals can be fitted. If, however, there is any doubt about the condition of the bore, then a new cylinder must be obtained and fitted. *Never re-use old seals*, as they will have deteriorated with age even though this may not be evident during visual inspection.

17 Reassembly of the master cylinder is the reverse sequence to removal, but the following additional points should be noted:

- a) Thoroughly lubricate all components in clean hydraulic fluid and assemble them wet.
- b) Refit the seals onto the pistons using fingers only, and ensure that they are fitted the correct way round.
- c) When refitting the secondary piston assembly, push the piston down the bore using a soft metal rod and insert the stop pin. The primary piston and remaining components can then be fitted.

### Refitting

18 Refitting is the reverse sequence to removal, but note the following additional points:

- a) Smear the O-ring with clean brake fluid before fitting it in the recess.
- b) On completion, bleed the hydraulic system as described in Section 2.
- c) Check that the low fluid warning system is functioning correctly.

### 18 Pressure regulating valve (single circuit system) - removal, overhaul and refitting



**Note:** All models with single circuit braking systems incorporate a pressure regulating valve in the rear brake hydraulic circuit. The valve regulates the hydraulic pressure available at the rear wheels, and therefore prevents the rear brakes from locking due to forward weight transfer under heavy braking. Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

#### Removal

- 1 Chock the front wheels then jack up the rear of the car and support it on axle stands (see "Jacking and vehicle support"). Remove the rear roadwheels.
- 2 Remove the brake master cylinder filler cap, top-up the reservoir, place a thin piece of polythene over the filler neck and refit the cap. This will reduce hydraulic fluid loss when the rear brake pipes are removed from the regulating valve.
- 3 Thoroughly clean the exterior of the valve, located on the rear subframe, ensuring that all dirt and grit is removed from the area around the brake pipe unions (see illustration).
- 4 Undo and remove the three hydraulic unions and lift the brake pipes out of the valve. Protect the ends of the pipes to prevent possible dirt ingress.
- 5 Undo and remove the retaining nut and bolt and lift the valve off its mounting.

#### Overhaul

- 6 Clamp the valve in a vice and remove the large end plug and sealing washer.
- 7 Lift out the valve assembly and return spring.
- 8 Thoroughly clean the components in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.

9 Examine the valve, cylinder bore and rubber seals for wear and renew as necessary. Rubber seals are not supplied separately, and if they appear swollen or worn it will be necessary to obtain a new valve assembly complete with seals.

10 Lubricate the components in clean hydraulic fluid and then refit the spring and valve assembly into the valve body. Now refit the end plug and sealing washer.

#### Refitting

11 Refitting the valve is the reverse sequence to removal. Bleed the hydraulic system as described in Section 2 on completion. If hydraulic fluid loss has been kept to a minimum it should only be necessary to bleed the rear brakes.

### 19 Pressure reducing valve (dual circuit system) - removal and refitting



**Note:** On certain models fitted with dual circuit braking systems a pressure reducing valve is used to limit the braking force at the rear wheels. The operation of the valve is similar to the pressure regulating valve used on single circuit systems. Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

#### Removal

- 1 Remove the brake master cylinder filler cap, top-up the reservoir, and place a thin piece of polythene over the filler neck. Secure the polythene with an elastic band or by refitting the cap. This will reduce hydraulic fluid loss when the brake pipes are disconnected from the valve.
- 2 Unscrew the four pipe unions from the reducing valve and carefully lift out the pipes. Protect the disconnected unions to prevent possible dirt ingress (see illustration).



- 3 Undo and remove the retaining bolt and lift off the valve.
- 4 The pressure reducing valve is a sealed unit and cannot be dismantled. If the valve is faulty it must be renewed as a complete assembly.

### Refitting

5 Refitting is the reverse sequence to removal. Bleed the hydraulic system as described in Section 2 on completion.

## 20 Pressure differential warning actuator (dual circuit system) - removal, overhaul and refitting



**Note:** On early type dual circuit braking systems, a separate pressure differential warning actuator, located on the engine compartment bulkhead, informs the driver of failure of one of the braking hydraulic circuits. On later systems so equipped, the warning actuator is incorporated in the master cylinder. Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

### Removal

- 1 Unscrew the brake master cylinder filler cap, place a piece of polythene over the filler neck and refit the cap. This will reduce hydraulic fluid loss when the brake pipes are disconnected.
- 2 Detach the electrical connector from the switch on the side of the warning actuator body.
- 3 Unscrew the hydraulic pipe unions and

- carefully remove the pipes. Protect the disconnected unions from possible dirt ingress.
- 4 Unscrew and remove the retaining bolt and lift off the unit.

### Overhaul

- 5 Clean off the exterior of the unit and make sure it is free from dirt and grit.
- 6 Undo and remove the end plug and discard the copper washer (see illustration).
- 7 Unscrew the warning light switch.
- 8 Tap the warning actuator body on a block of wood to release the shuttle valve piston assembly and withdraw it from the bore.
- 9 Remove the two rubber seals from the piston.
- 10 Wash the components in clean hydraulic fluid or methylated spirit and dry with a lint-free cloth.
- 11 Carefully inspect the piston and the casing bore for scoring and damage. If the bore and piston are not in perfect condition, renew the complete pressure differential warning actuator. If the components are in a satisfactory condition obtain new seals and a new copper sealing washer. Do not re-use the old seals.
- 12 Reassembly of the unit is the reverse of the dismantling sequence. Lubricate all the parts with clean hydraulic fluid and assemble them wet. Observe the specified torque wrench settings when refitting the end plug and warning light switch.

### Refitting

- 13 Refitting is the reverse sequence to

removal. Bleed the hydraulic system as described in Section 2 after refitting.

14 After bleeding the braking system, switch on the ignition and observe the brake failure warning light. If the light is illuminated, press the brake pedal hard: the light should go out and stay out when the pedal is released. If the light fails to go out, the pressure in the braking system is unbalanced or there is a fault in the warning actuator or its switch. Bleed the braking system again, and if this fails to cure the trouble, investigate the warning actuator and the switch.

15 If the brake failure warning light is not illuminated when the brake pedal is depressed, but does come on when the test-push on the switch is operated, then the system is functioning satisfactorily.

## 21 Vacuum servo unit - removal and refitting



### Pre-1989 models

#### Removal

- 1 Unscrew the brake master cylinder filler cap, place a piece of polythene over the filler neck and refit the cap. This will minimise hydraulic fluid loss when the servo is removed.
- 2 From under the right-hand front wing detach the inlet ducting from the inlet unit and then withdraw the inlet unit from inside the engine compartment.
- 3 Disconnect the vacuum pipe from the one-way valve on the servo unit.
- 4 Remove the securing bracket from the end of the servo unit.
- 5 Unscrew the hydraulic pipe unions and carefully withdraw them from the servo. Protect the disconnected unions against possible dirt ingress.
- 6 Undo and remove the nuts securing the servo to its mounting bracket and lift away the unit.

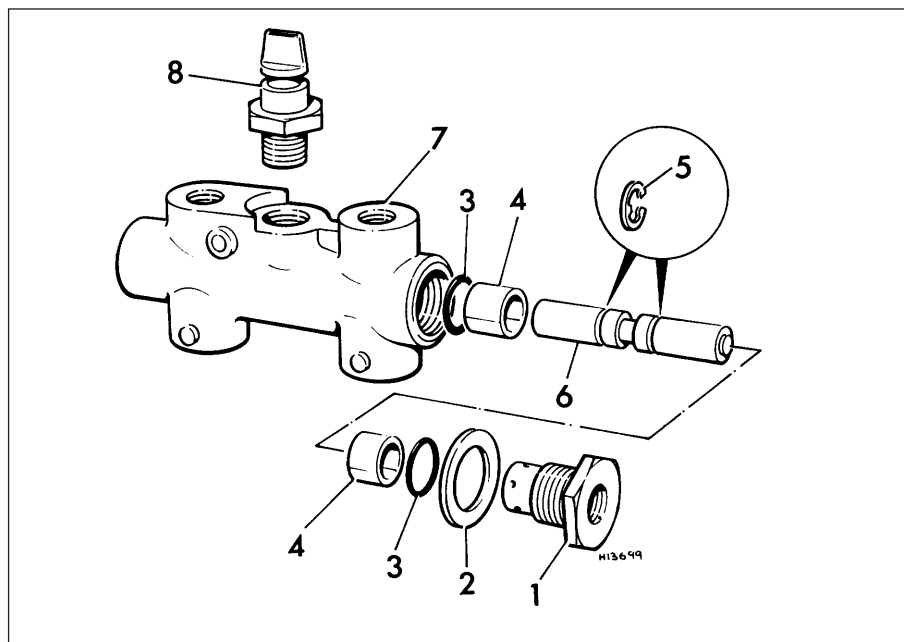
#### Refitting

7 Refitting is the reverse sequence to removal. Bleed the hydraulic system as described in Section 2 on completion.

### 1989 models onward

#### Removal

- 8 Disconnect the low brake fluid level warning light wiring from the master cylinder fluid reservoir filler cap.
- 9 Unscrew the master cylinder mounting nuts from the servo unit.
- 10 Position a container beneath the master cylinder, then loosen (but do not remove) the hydraulic pipe union nuts, to prevent damage to the pipes when the master cylinder is moved from the servo unit. Move the master cylinder clear of the servo unit, then retighten the union nuts.



20.6 Exploded view of the pressure differential warning actuator

- |                 |           |          |
|-----------------|-----------|----------|
| 1 End adapter   | 4 Sleeve  | 7 Body   |
| 2 Copper washer | 5 Circlip | 8 Switch |
| 3 O-ring        | 6 Piston  |          |

## 9•18 Braking system

**11** Disconnect the vacuum hose from the servo unit, and release it from the clip.

**12** Extract the split pin, and withdraw the clevis pin securing the pushrod to the brake pedal.

**13** Disconnect the anti-run-on valve hoses, and plug them.

**14** Unscrew the bolt securing the anti-run-on valve to the servo mounting bracket.

**15** Unscrew the mounting nuts and bolts, and withdraw the servo unit and bracket assembly from the engine compartment.

**16** Separate the servo unit from the bracket by disconnecting the clevis and unscrewing the nuts. Prise the O-ring from the recess in the master cylinder.

**17** Refitting is the reverse sequence to removal. Smear the O-ring with clean brake hydraulic fluid and bleed the hydraulic system as described in Section 2 on completion.

### 22 Vacuum servo unit air filter (1989 models onward) - renewal



**1** Working in the engine compartment, prise back the rubber boot from the rear of the servo, and slide it along the push rod (see illustration).

**2** Prise the air filter from inside the servo body.

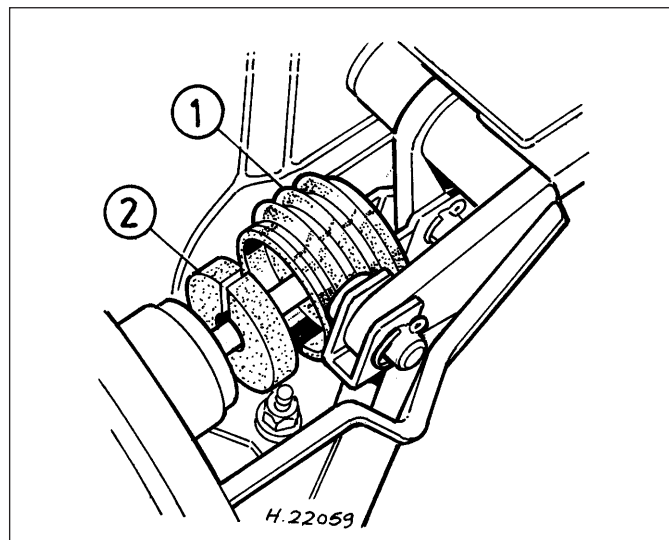
**3** Cut the new air filter in one place with a sharp knife, then locate it over the pushrod and push it into the servo body.

**4** Refit the rubber boot.

### 23 Brake pedal - removal and refitting



The brake pedal is removed together with the clutch pedal, and full information on the removal and refitting procedure will be found in Chapter 6.



22.1 Vacuum servo unit air filter

1 Rubber boot

2 Air filter